



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/566,041	10/13/2006	Volodymyr Lysenko	13885-3	9342

45473 7590 05/25/2010
BRINKS, HOFER, GILSON & LIONE
P.O. BOX 1340
MORRISVILLE, NC 27560

EXAMINER	
JOHNSON, KEVIN M	

ART UNIT	PAPER NUMBER
1793	

MAIL DATE	DELIVERY MODE
05/25/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/566,041

Applicant(s)

LYSENKO ET AL.

Examiner

KEVIN M. JOHNSON

Art Unit

1793

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 2/11/2010.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 16-30 is/are pending in the application.
- 4a) Of the above claim(s) 20-30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 16-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SI/22)
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____
- Paper No(s)/Mail Date: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).
4. Claims 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tom et al. (US 5704967) in view of Tam (US 5604162).

In regard to claims 16 and 17, Tom discloses an apparatus for the storage of a gas. The device includes a high surface area solid sorbent contained within a storage reservoir (fig. 6). An appropriate sorbent material is porous silicon (column 5, lines 39-43). Tom fails to disclose that the porous silicon is nanostructured and meets the structural limitations of the instant claims.

Tam discloses that porous silicon is characterized by pores in the range of 1-100 nm, and that the nanocrystallites that are contained in the porous silicon material are of similar dimensions (column 2, lines 44-48). The surface area of the porous silicon disclosed by Tam may be as high as $900 \text{ m}^2/\text{cm}^3$ (column 5, lines 22-23).

It would have been obvious to one of ordinary skill in the art at the time of the invention that the porous silicon disclosed as a sorbent by Tom would meet the requirements of the instant claims. Tam discloses that porous silicon is characterized by nanopores and nanocrystallites (column 2, lines 44-48), with a specific surface area that greatly exceeds the level required by the instant claims. One of ordinary skill in the art at the time of the invention would realize that the nanoporosity and high specific surface area of the material disclosed by Tam would necessarily indicate that the nanostructured material would necessarily have a cumulative surface area greater than the plane surface occupied by the nanostructure. The apparatus disclosed by Tom would necessarily be capable of storing hydrogen, as it meets all the structural limitations of the device required by the instant claims that is capable of storing hydrogen.

5. Claims 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tom in view of Tam as applied to claim 16 above, and further in view of Nowobilski et al. (US 4749384).

In regard to claims 18 and 19, Tom discloses that the sorbent may be crushed or comminuted prior to its use in the storage reservoir (column 5, lines 31-38). Tom and Tam fail to disclose that the sorbent is compacted.

Nowobilski teaches that it is known to utilize a compacted adsorbent in a gas storage system that uses adsorbent filled reservoirs to store gas (column 2, line 67-column 3, line 9). The compaction of the adsorbent allows the best utilization of the space within the storage vessel.

It would have been obvious to one of ordinary skill in the art at the time of the invention to compact the porous silicon adsorbent disclosed by Tom. Such a modification would have been motivated by the teaching in Nowobilski that compacting the adsorbent in gas storage systems allows the most efficient utilization of the storage volume (column 2, line 67 – column 3, line 9).

Response to Arguments

6. Applicant's arguments filed 2/11/2010 have been fully considered but they are not persuasive.

The argument that Tom does not disclose that the fluid storage system may be used to store hydrogen is not sufficient to overcome the rejection of the instant claims. It is agreed that Tom does not expressly disclose that the system may be used to store elemental hydrogen, but the system disclosed by Tom, when considered in view of the

teachings of Tam, would necessarily be capable of storing hydrogen because it meets all the structural limitations of the instant claims. It is important to note that the instant claims are drawn to an apparatus that is capable of storing hydrogen, and not a method of storing hydrogen.

The argument that the system disclosed by Tom can not be used for the storage of hydrogen because Tom teaches that thermal desorption may be used to release the adsorbed material from the sorbent is not persuasive. As pointed out by applicant Tom teaches that thermal desorption *may* be used not that it is required. Further, the instant claims are drawn to the hydrogen storage apparatus itself and not the method for utilizing it so the methods disclosed by Tom for utilizing the disclosed apparatus are not relevant to the instant claims.

The argument that Tam does not disclose a nanostructure with the required surface area and geometry is not persuasive. As disclosed in the above rejection, Tam teaches that porous silicon is characterized by pores in the range of 1-100 nm, and that the nanocrystallites that are contained in the porous silicon material are of similar dimensions (column 2, lines 44-48). Additionally, the surface are of the porous silicon disclosed by Tam may be as high as $900 \text{ m}^2/\text{cm}^3$ (column 5, lines 22-23). Tam does not expressly disclose that the cumulative surface are of the nanostructured material exceeds the area of the plane surface occupied by the nanostructure, but it would have been obvious to one of ordinary skill in the art at the time of the invention that the porous silicon material disclosed by Tam would satisfy this requirement of the instant claims due to the material's nanoporosity and very high surface area.

In response to applicant's argument that the apparatus disclosed by Tom and Tam does not suggest the use of the apparatus for the storage of hydrogen, a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KEVIN M. JOHNSON whose telephone number is (571)270-3584. The examiner can normally be reached on Monday-Friday 9:00 AM to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Curtis Mayes can be reached on 571-272-1234. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Kevin M Johnson/
Examiner, Art Unit 1793

/David M Brunsman/
Primary Examiner, Art Unit 1793